hardening of the tissues in a somewhat extended circuit. When the above-mentioned tumors were cut over, they presented the exact appearance of a fresh tubercular udder inflammation, that is to say, the gland lobes were swollen, firm, and of grayish color, slighly translucent, and with yellow streaks corresponding with the lacteal passages. In dried preparations of tissue from the tumors, as well as from the infiltrated regions, tubercle bacilli could be demonstrated, and sections showed on both sides the presence of typical tuberculous tissue with giant cells containing bacilli. Thus there could be no doubt but that in all three cases a commencement of tuberculosis had to be contended with. The slighter the development of the tubercular attacks in the udder, so much the fewer will be the number of bacilli thrown off from the milk. In full agreement with this, it was found, that, of the two inoculated guinea-pigs, only one was attacked in the case where but two small tumors of a pea-size were found in the udder. The other guinea-pig was killed four weeks after the inoculation and was found to be perfectly sound. In the last of the four cases where the milk was found communicative of infection, no discernible tubercular attack was to be detected in the udder. This case, however, differed in some degree from the others. The cow in question died of tuberculosis of chronic character and in a very advanced stage, several of the organs having been attacked (the lungs, pleura, mesenteric glands, liver, and intestines), while the other cows whose milk had been examined had all been slaughtered. With these the attack had not reached the extreme stage, although in many of them it was found to be far advanced.

While this case would thus seem to prove that the tubercle bacilli can pass over to the milk without the previous existence of any tubercle tissue in the udder, it is at the same time observed that in this case there is all reason for regarding it as one of exceptional character. From the detailed report on these researches it may perhaps be gathered that the matter in question stands somewhat in the following position: If it really be the case that the milk of tuberculous cows is of such great danger as the medium of communicating infection, it might certainly be expected, looking at the great spread of tuberculosis among cattle, that the disease would, at the same time, be conveyed to human beings much more frequently than it seems, in fact, really to occur with the raw milk and (though perhaps in a somewhat less degree) with the dairy produce, especially of butter and cheese. The generally entertained opinion that milk from tuberculous cows, as a rule, only under certain conditions, was really of such dangerous character, would appear to be much more in accordance with the results obtained.

To prevent the conveyance of infection to the human being through the medium of tuberculous cows' milk, it should be the main consideration to watch for the earliest appearance of swelling or tumor of a tuberculous nature in the cow. Such recognition, as a rule, will not be of much difficulty, and at any rate will lead to good grounds of suspicion, such as a firm, painless, and, as a rule, speedily spreading glandular swelling, with the secretion in the first weeks retaining its natural appearance, but later on becoming thinner and more watery, but seldom of a pus nature. The question of danger of infection through the use of such milk is perhaps sufficiently summed up in the following words of the report on these researches, namely, that milk obtained from a tuberculous cow with an apparently sound udder, as a rule, will not be found dangerous; but, at the same time, as in no individual case can it be said with certainty that one may not be dealing with one of the depicted exceptions from the general rule, it would be advisable to regard such milk with suspicion in respect to its infecting powers.

NOTES AND NEWS.

A LONG time ago, says the *Engineering and Mining Journal*, the distinguished French astronomer Flammarion expressed the belief that communication would be established one day between the earth and the planet Mars. The idea seems to have appealed very strongly to the fancy of an old lady at Pau, France, who died recently, bequeathing a legacy of 100,000 francs as a reward to the first scientist who may devise a scheme for successfully accomplishing the feat. The money, which is payable for ten years only, is to be held in trust by the French Institute.

— Silo experience in the United States now covers more than ten years, and so far as the economy of producing silage and the advantages of feeding it are concerned, there appears to be everywhere, among those who have operated successful silos, a strong conviction that good silage is a superior and cheap feed; but the same experience is now fast demonstrating serious imperfections in the construction of perhaps a majority of existing silos in this country. Some silos have so rapidly deteriorated as to become utterly useless for the purpose for which they were intended inside of three or even two years, unless they are subjected to extensive repairs, while others have never successfully preserved the materials placed in them. With a view to obviating these difficulties in the construction of future silos, and of suggesting remedies for the defects of existing ones, a study of the actual construction and condition of silos now in use has been undertaken by F. H. King, physicist of the Wisconsin Agricultural Experiment station. Thus far he has examined ninety-three silos, and the results of his labors, together with valuable suggestions about the construction and repair of silos, are given in the July bulletin of the station named.

— Mr. O. Chanute, a well-known engineer of Chicago, having during recent visits to Europe gathered much information concerning the methods and results of preparing wood chemically to resist decay, says he is confirmed in the opinion that the time has arrived when great economies may be realized by the adoption of these methods on railroads in many parts of this country. He recently examined some experimental railroad ties of the most perishable kinds of wood, prepared by what is known as the zinc-tannin (Wellhouse) process, in St. Louis, in 1881 and 1882, and laid in the tracks of the Atchison, Topeka, & Santa Fe Railroad, as Topeka, Kan., and La Junta, Col. After nine or ten years' exposure they show excellent results, whereas they would have lasted but from one to four years if unprepared. Unprepared ties of the same kind of timber, laid at the same time, adjoining to the prepared ties, have all decayed and been taken up, while present appearances indicate that the prepared ties (red oak, black oak, and Colorado pine) are likely to show an average life of ten to fifteen years or more. Not only does the zinc-tannin process preserve ties against decay, he says, but it hardens them as well. It is found on one railroad that after three years' exposure treated hemlock ties hold the spike as well and cut less under the rail than untreated white oak. He is convinced by experience that on many railroads, where white oak is getting scarce, an economy of a hundred dollars a year per mile of track can be effected by preparing ties of inferior kinds of wood to resist decay by the process mentioned.

— The Leland Stanford Junior University of California has announced the names of the members of its faculty. The professorships in engineering and scientific studies are held as follows: John Casper Branner, formerly of the University of Indiana, professor of geology (work to begin in 1892); Oliver Peebles Jenkins, formerly of De Pauw University, professor of physiology and histology; John Henry Comstock, formerly of Cornell University, non-resident professor of entomology (resident in January, February, and March); John Mason Stillman, formerly of the University of California, professor of industrial and inorganic chem-

istry (work to begin in 1892); Ferdinand Sanford, formerly of Lake Forest University, professor of physics; Charles David Marx, formerly of the University of Wisconsin, professor of civil engineering; Joseph Swain, formerly of Indiana University, professor of mathematics; Horace Bigelow Gale, formerly of Washington University, St. Louis, professor of mechanical engineering; Charles Henry Gilbert, formerly of Indiana University, professor of vertebrate zoölogy; Douglas Houghton Campbell, formerly of Indiana University, professor of cryptogamic botany; George Mann Richardson, formerly of Lehigh University, assistant professor of inorganic chemistry; Louis Alexander Buchanan, formerly of the St. Louis Polytechnic Evening School, foreman of the wood-working shop; and Daniel Kirkwood, formerly of Indiana University, non-resident lecturer on astronomy (resident in May).

— The necessity of devoting to sleep several hours in each day, says the *Lancet*, is too obvious to admit of serious question. The proper selection of these hours is also, for those who would prolong and usefully employ life, a very needful consideration, though its importance may to some be less evident. We have all met with persons, outside of hospitals and of parliament, who do half or more of their daily work after nightfall, and sleep long after earlier rising men are awake and busy. Some of these are wont to extol the comfort of their morning slumbers. They describe as immense the refreshment they receive from six or seven hours thus agreeably spent, and no wonder, for the sense of present satisfaction must be very marked, and that for definite reasons. Man, in common with most of the animal creation, has accepted the plain suggestion of Nature that the approach of night should imply a cessation of effort. If he ignores this principle his work is done against inherited habit, and, so far, with additional fatigue. It follows, too, from our ordinary social conditions, that he must use artificial light, and sustain its combustion at the cost of his own atmosphere. Naturally, therefore, when he does rest, his relief is in proportion to his weariness. As in many other cases, however, sensation is not here the most reliable guide to judicious practice. Established custom affords a far truer indication of the method most compatible with healthy existence. The case of the overworked and the invalid lends but a deceptive color to the argument of the daylight sleeper. In them excessive waste of tissue must be made good, and sleep, always too scanty, is at any time useful for this purpose. For the healthy majority, however, the old custom of early rest and early waking is certain to prove in future, as returns of longevity and common experience alike show that it has proved in the past, most conducive to healthy and active life.

— The results of an investigation concerning the cause of the insolubility of pure metals in acids, contributed by Dr. Weeren to a recent number of the *Berichte*, are given in abstract in *Nature* of July 16. De la Rive, so long ago as the year 1830, pointed out that chemically pure zinc is almost perfectly insoluble in dilute sulphuric acid. Hitherto, however, the hypotheses put forward attempting to account for this singular fact have been any thing but satisfactory. The theory of Dr. Weeren is extremely simple, and is fully supported by the most varied experiments, physical and chemical. It may be stated as follows: "Chemically pure zinc and also many other metals in a state of purity are insoluble or only very slightly soluble in acids, because, at the moment of their introduction into the acid, they become surrounded by an atmosphere of condensed hydrogen, which under normal circumstances effectually protects the metal from further attack on the part of the acid." It is found that when a piece of pure zinc is immersed in dilute sulphuric acid, a slight action does occur during the first few succeeding moments, zinc sulphate and free hydrogen being formed in minute quantity. The free hydrogen, however, instead of escaping, becomes condensed by the molecular action of the zinc upon the surface of the latter, and is retained there with great tenacity as a thin mantle of highly compressed hydrogen gas, capable of affording perfect protection against further inroad of the acid. The experiments from which this simple and very probable explanation has been derived were briefly as follows. The amount of chemically pure zinc dissolved by the acid was first determined. It was, of course, an exceedingly minute quantity. Considering this amount as unity, it was next sought to determine what difference would be effected by performing the experiment *in vacuo*, when of course the escape of the hydrogen would be greatly facilitated. The solubility was found under these circumstances to be increased sevenfold. Next the experiment was performed at the boiling temperature of the dilute acid, first when ebullition was prevented by increasing the pressure, and secondly when ebullition was unhindered, thus again facilitating the removal of the hydrogen film. In the first case, when ebullition was prevented, the solubility was practically the same as in the cold; while in the second case, with uninterrupted ebullition, the solubility was increased twenty-four times. Finally, experiments were made to ascertain the effect of introducing into the acid a small quantity of an oxidizing agent capable of converting the hydrogen film to water. When a little chromic acid was thus introduced the solubility was increased 175 times, and when hydrogen peroxide was employed the solubility was increased three-hundred-fold. The explanation of the ease with which the metal becomes attacked when the ordinary impurities are present is that the hydrogen is not then liberated upon the surface of the zinc, but rather upon the more electro-negative impurities, leaving the pure zinc itself open to the continued attack of the acid. The same of course occurs when a plate of platinum is placed in contact with a plate of pure zinc in the acid. The action of nitric acid, the only common acid which does attack pure metals, is evidently due to the oxidation of the hydrogen film by further quantities of the acid, with formation of water and production of the lower oxides of nitrogen, and even under certain circumstances of ammonia.

— The regular quarterly meeting of the Michigan State Board of Health was held at Lansing, July 14. The most important action taken was to direct the secretary to publish a brief pamphlet telling how to restrict and prevent consumption, the pamphlet having been adopted by the board after very careful consideration. This pamphlet states that "consumption is the most common and fatal disease," "that the number of deaths which actually occur in Michigan from consumption is probably over twenty-five hundred per year," that "consumption is now known to be a communicable disease," and that "a large part of this mortality can and ought to be prevented." The pamphlet describes the bacillus which causes consumption and which is in the sputa of consumptives, cites instances where consumption has been communicated by the sputum dust containing these germs, and emphasizes the importance of destroying the sputa of consumptives. The pamphlets on the restriction and prevention of the other most dangerous communicable diseases, diphtheria and scarlet-fever, were ordered reprinted for distribution among the neighbors of those sick with those diseases throughout the State. A proposed pamphlet on the "Restriction and Prevention of Measles" was thoroughly discussed by paragraphs, amended, and the secretary was directed to print and distribute the document for instruction, and as an aid in the restriction and prevention of this disease, which the board declares is a disease "dangerous to the public health," that causes many more deaths in Michingan than small-pox does, and which should be dealt with according to the laws in Michigan.

— In the May number of the *Journal de Botanique*, says *Nature*, MM. Bureau and Franchet describe a number of new plants from the collections recently brought home by M. Bonvalot and Prince Henry of Orleans, and give a general summary of their character, of which the following is an abstract. The collection was made almost entirely in a narrow band of territory reaching from Lhassa eastward near the 30th parallel of north latitude by way of Batang and Sitang to Tatsienlow, in the province of Szechwan, in west China, from which place their route was deflected at a right angle to Yunnan. Considered in its general aspect, the flora of this region, as shown in the collection, is marked by the stunted form of the shrubs and dwarf character of the herbaceous vegetation. Of the forest trees, *Coniferæ* and others, no specimens were brought. It is characteristically a vegetation of high peaks, where drought and strong winds are the main climatic features. The

Papaveraceæ are represented especially by dwarf, large-flowered kinds of *Meconopsis*. The greater number of the species of *Corydalis* are not more than two or three inches high. The *Cruciferæ*, such as *Parrya ciliaris*, in the same way are dwarf and large-flowered. *Silene cæspitosa* may be compared with the most dwarf states of *S. acaulis* of our own high mountains. The honeysuckle of Thibet constitutes only a small bush about a foot high, with intertangled branches. But it is especially in the rhododendrons and primulas that this dwarf character is remarkable. All the rhododendrons and primulas found between Lhassa and Sitang—*R. principis*, *R. primulæflorum*, *R. nigropunctatum*, *Primula leptopoda*, *P. diantha*, and *P. Henrici*—may be ranged amongst the dwarfest types of the genera to which they belong. It is the same with *Incarvillea*. The Thibetan species belong to a group found also in Kansu and central Yunnan, with stem almost obliterated and corolla very large. Passing eastward in Szechwan the flora puts on a different character. The leaves become larger, the number of flowers to each plant increases. There are many *Rosaceæ*, orchids, and species of pedicularis; amongst the *Compositæ* the genus senecio is particularly well represented, and there are several everlastings that approach the edelweiss of the Swiss Alps. The flora of this eastern part of Thibet and western region of Szechwan has a strong affinity both with that of the Sikkim Himalaya and that of central Yunnan. *Meconopsis Henrici* represents the Himalayan *M. simplicifolia* Hook. et Thoms.; *Astragalus litargensis*, *A. acauils* Benth., *Rubus xanthocarpus*, *R. sikkimensis*; *Brachyactis chinensis*, *B. menthodora*; *Gnaphalium corymbosum* answers to *G. nubigenum*; *Androsace bisulca* to *A. microphylla*; and there are many other similar parallels between the plants of Thibet and Sikkim, and in the same many parallels may be found between the new species found by the travellers in Thibet and those gathered by Delavay in Yunnan.

— The numerous letters received at the Wisconsin Agricultural Experiment Station in relation to the chinch bug show that this pest has already done much harm to wheat and barley in some sections of that State, and that it is now moving from the grain fields into the corn fields. Any remedies tried must be quickly applied. It is now too late to introduce infected bugs, such as have been sent out by Professor Snow of Kansas. The kerosene emulsion remedy which is now being successfully used by Dr. E. Fred Russell of Poynette, Columbia County, is recommended. It is made as follows: Slice half a pound of common bar soap; put it in a kettle with one gallon of soft water and boil until dissolved; put two gallons of kerosene in a churn or stone jar, and to it add the boiling hot soap solution; churn from twenty to thirty minutes, when the whole will appear creamy. If properly made no oil will separate out when a few drops of the emulsion are placed on a piece of glass. To each gallon of the emulsion add eight gallons of water and stir. Apply with a sprinkling pot. Every farmer should learn to make this emulsion as it a most useful insecticide. It is especially valuable for killing lice on cattle and hogs. Paris green will not kill chinch bugs. If the bugs are not yet in the corn, plow a deep furrow along the side of the field they will enter and throw into it stalks of green corn. When the bugs have accumulated on the corn, sprinkle with the emulsion. Put in fresh stalks, and sprinkle whenever the bugs accumulate. If they break over the barrier, as they probably will, run a new furrow a few rows back in the corn and repeat. Where they have attacked stalks of standing corn, destroy by sprinkling. If the remedy is tried it should be used persistently. To kill one lot of bugs and then stop will do little or no good. When the bugs threaten to destroy as much as five or ten acres it will pay for one or two men to devote their whole time to the warfare. Only a part of each day, however, will be needed. Some corn will be lost at best, but the most of the field should be saved. Any one trying the remedy is requested to send the results of his experience to the experiment station.

— Professor Martens of Berlin has published in the *Mittheilungen aus den Kœniglichen technischen Versuchanstalten zu Berlin* a report (summarized in *Engineering* of July 17) of some experiments on the strength of steel at various temperatures between 20° C. and 600° C. The material used consisted of mild steel, having a tensile strength of 23 tons, 27 tons, and 30 tons per square inch. The bars from which the test pieces were cut were 1.5 inches in diameter and were thoroughly annealed. A number of bars of the same quality of metal were all tested in the usual way, both after annealing, and as received from the makers, so as to form a standard for the other bars. The temperature of the bars was made uniform by placing in a bath and testing them there. For the low temperature tests the bath was filled with a freezing mixture, and for the high temperature tests, with paraffine, up to 200° C., beyond which alloys of lead and tin were used. The contents of the bath were warmed by gas jets, and stirred during the course of the experiments. The elongations of the bar up to the yield point were taken on a length of 8.1 inches by means of a mirror apparatus, the diameter of the tested portion being 0.79 of an inch, and autographic diagrams were also taken of each specimen. The results of the experiments showed that the elastic limit of the material became lower as the temperature rose, though the falling off was not very serious up to 200° C., but beyond that point it lowers somewhat rapidly, and finally seems to disappear. The maximum stress decreases from 20° C. up to 50° C., but afterwards rapidly rises to a maximum somewhere between 200° and 250° C. Taking the strength of the specimen at 20° C., the maximum stress for the 23-ton steel is 1.34 greater, and the maximum breaking stress is 1.62. For the 27-ton steel the figures are 1.27 and 1.45, and for the 30-ton steel 1.25 and 1.50. The contraction of area for all the specimens was least at about 300° C.

— London *Engineering* announces the formation of a British syndicate, to be known as the Great Lakes Navigation Trading Company, Limited, having a capital of one million sterling with which to establish a fleet of ten steamers, each of 1,500 tons, to establish water communication between Chicago and Great Britain *via* the Great Lakes. The vessels are to be of such dimensions as will enable them to pass through the locks on the Canadian canals, and it is said that they will be ready for starting the service next spring. Keeping in mind the restless activity of Chicago, says the journal named, it is surprising that no regular service of steamers has been started between that port and Britain. There is sufficient traffic. In the Great Lakes there was carried in 1889 nearly 27,500,000 tons of cargo, the fleet of steamers consisting of 2,055 vessels, of 826,000 tons, worth nearly twelve millions sterling. The arrivals and clearances at Chicago have in ten years increased by 72 per cent to 10,250,000 tons, and it is possible to conceive of an equally large increase in the next decade, for 54,411 miles of railway terminate in that city, and in a year work 43,000,000 tons of freight. Besides, in the central northern and north-western groups of States the total tonnage of freight moved is 196,000,000 tons. A fair proportion of this comes to Europe, principally grain; and probably if through sea communication could be established and freight rates reduced, a still larger quantity might be sent. The distance from Chicago to Liverpool by the lakes and *via* New York does not differ much. By the lakes, Welland Canal, and St. Lawrence River, 4,488 miles, and *via* New York by rail, 4,353 miles; so that the latter distance can be covered in 337 hours against 346 hours in the other case. By rail to Montreal and thence by steamer the distance is 4,062 miles, requiring 328 hours. But after all, time is not a material consideration in cargo traffic. The freight rates should decide. Mr. Corthell, in a paper read recently before the Canadian Society of Civil Engineers, strongly advocates the development of this lake trade to England, by the deepening and lengthening of locks and canals, and the construction of ship railways, and he gives figures based on average rates to show that it is probable that freight could be carried by way of the lakes at half the cost of that sent by rail to New York or Montreal, and thence by steamer to Britain. If this be so, then the Chicago people, and particularly Canadians, will do well to study the matter, because to Canada, possibly more than to America, Britain may in the future have to look for grain supplies. The new syndicate wisely lay themselves out for a distinct trade. The vessels are to have extensive refrigerators. To overcome the disadvantage of the season of ice-bound rivers, which continues for rather more than a third of the year, a terminus is to be made at Portland, Maine.